3.0 SCRUBS

3.1 FINAL INSPECTION – WEATHER SCRUB 1

A Final Inspection of the cryoloaded vehicle was performed on 24 April 2000 from 1020 to 1150 hours during the two-hour built-in-hold at T-3 hours in the countdown. There were no Launch Commit Criteria (LCC), OMRS, or NSTS-08303 criteria violations relating to the flight hardware.

Due to the time of year, there were no acreage or protuberance icing concerns. All acreage was dry with virtually no condensate present. The ET LO2 tank acreage temperatures averaged 65 degrees F at the time of the inspection. The surface temperatures on the LH2 tank averaged 66 degrees F. There was no protuberance icing outside of the established database.

A total of six hairline cracks were detected in ET intertank valley TPS. There was one crack in each quadrant with the exception of the +Y+Z quadrant, which had three cracks. The cracks ranged in length from 4 to 18 inches, were less than 1/8-inch wide, had no offset, and exhibited no ice or frost. Therefore, all were acceptable for flight per NSTS-08303.

The –Y vertical strut exhibited a dogleg stress relief crack approximately 5 inches long by 1/8-inches wide, which was acceptable for flight per NSTS-08303.

There were no tile or RCC panel anomalies on the Orbiter. All RCS thrust paper covers were intact. The F2U and F3L covers were discolored, but not wet. Less than usual amounts of ice and frost had formed on the SSME nozzle to heat shield interfaces.

Launch was scrubbed at the end of the window due to weather violations (RTLS crosswinds).

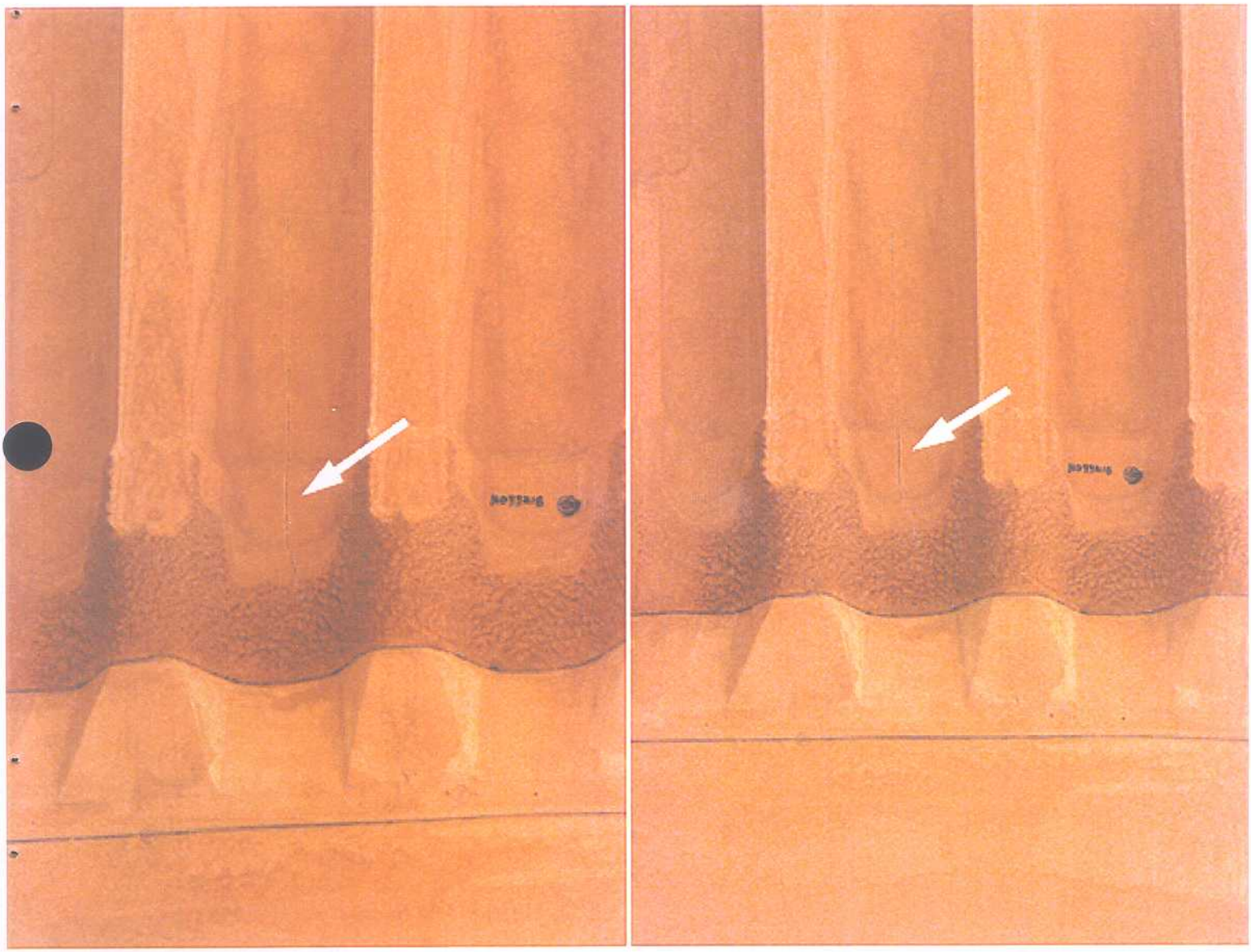

Photo 3: Hairline Cracks in Intertank Stringer Valleys

A total of six hairline cracks were detected in ET intertank valley TPS. There was one crack in each quadrant with the exception of the +Y+Z quadrant, which had three cracks. The cracks ranged in length from 4 to 18 inches, were less than 1/8-inch wide, had no offset, and exhibited no ice or frost. Therefore, all were acceptable for flight per NSTS-08303.

3.2 POST DRAIN INSPECTION

The post drain inspection was conducted on 24 April 2000 from 2120 to 2230 hours under dark conditions. Prior to leaving LCC Firing Room 2, a request was made to have the xenon lights turned on. The inspection was performed with adequate lighting.

The southwest (-Y) ET GOX vent seal footprint area was in clear view from the end of the GOX vent arm. An inspection of the footprint area revealed no new topcoat damage areas. The visible areas of missing topcoat compared exactly to those documented on IPR 101V-0299. The northeast (+Y) ET GOX vent seal footprint area was not accessible for inspection with the GOX vent hood lifted. OTV surveillance inspection during detank operations of seal deflation and hood lift revealed no indications of topcoat peel-off or adhesion of the seal to the ET footprint. OTV inspection of the seals showed no indication of topcoat adhering to the seal material.

The External Tank was in excellent condition. Bipod jack pad standoff closeouts were nominal. All PDL repairs were intact with none protruding. No crushed foam or debris was detected in the LO2 feedline support brackets. The stress relief crack in the –Y vertical strut forward surface TPS was not visible. A small frost spot was present on the LH2 aft dome apex closeout. Vapors had been observed from the firing room OTV in this area lasting approximately two minutes.

The only ice/frost accumulations remaining were located in the LO2 feedline bellows and support brackets, the LH2 ET/ORB umbilical purge curtain barrier, and on the ET/ORB umbilical purge vents.

Orbiter tiles, RCC panels, and SSME's were in nominal configuration. RCS thruster paper covers were intact, though the cover on R4R was discolored.

The MLP deck inspection revealed tape at the sound suppression down-comer pipe support adjacent to HDP #2.

In summary, the drain inspection produced no IPR conditions and no flight hardware concerns. There were no constraints for the next cryoload.

3.3 FINAL INSPECTION – WEATHER SCRUB 2

A Final Inspection of the cryoloaded vehicle was performed on 25 April 2000 from 1000 to 1130 hours during the two-hour built-in-hold at T-3 hours in the countdown. There were no Launch Commit Criteria (LCC), OMRS, or NSTS-08303 criteria violations relating to the flight hardware.

Due to the time of year, there were no acreage or protuberance icing concerns. All acreage was mostly dry with a small amount of condensate present. The ET LO2 tank acreage temperatures averaged 68 degrees F at the time of the inspection. The surface temperatures on the LH2 tank averaged 66 degrees F. There was no protuberance icing outside of the established database.

Generally, the ET was in excellent condition for a second cryogenic loading.

The number of cracks detected in ET intertank valley TPS increased from 6 to 12. There were cracks in all four quadrants. The cracks ranged in length from 2 to 18 inches, were less than 3/16-inch wide, had no offset, and exhibited no ice or frost. Therefore, all were acceptable for flight per NSTS-08303

The –Y vertical strut exhibited a dogleg stress relief crack approximately 5 inches long by 1/8-inches wide, which was acceptable for flight per NSTS-08303.

A thermal short created an ice formation 4-inches long by 1-inch wide by 3/8-inch think on the +Y longeron. No crack in the TPS was visible during this observation. The condition was acceptable for flight per NSTS-08303.

There were no tile or RCC panel anomalies on the Orbiter. All RCS thrust paper covers were intact. The F2U and F3L covers were discolored and slightly wetter. Four additional covers (F1D, F3U, R1R, R4R) were slightly discolored. Typical amounts of ice and frost had formed on the SSME nozzle to heat shield interfaces.

Launch was scrubbed at the end of the window due to weather violations (high winds).

3.4 POST DRAIN INSPECTION

The post drain inspection was conducted on 25 April 2000 from 1900 to 2030 hours under sunset conditions. Prior to leaving LCC Firing room 2, a request was made to have the xenon lights turned on. The inspection was performed with adequate lighting.

The southwest (-Y) ET GOX vent seal footprint area was in clear view from the end of the GOX vent arm. An inspection of the footprint area revealed no new topcoat damage areas. The visible areas of missing topcoat compared exactly to those documented on IPR 101V-0299. The northeast (+Y) ET GOX vent seal footprint area was not accessible for inspection with the GOX vent hood lifted. OTV surveillance inspection during detank operations of seal deflation and hood lift revealed no indications of topcoat peel-off or adhesion of the northeast seal to the footprint. Technician inspection of the seals confirmed no topcoat adhering to the seal material.

The External Tank was in excellent condition. Bipod jack pad standoff closeouts were nominal. The twelve cracks observed in Intertank stringer valleys during final inspection were no longer visible. All PDL repairs were intact with none protruding. No crushed foam or debris was detected in the LO2 feedline support brackets. The stress relief crack in the –Y vertical strut forward surface TPS was not visible. A four-inch crescent shaped crack was detected in the +Y longeron closeout at approximate station XT-1960 and documented on IPR 101V-0310. Preliminary approval for MRB use-as-is had been coordinated with LMMSS-MAF pending only final dimensions that would be obtained during the next Final Inspection at T–3 hours.

Ice/frost accumulations were still present at the ET/SRB cable tray to aft fairing interface, the LO2 feedline bellows and support brackets, the LH2 ET/ORB umbilical purge curtain barrier, LH2 recirculation line bellows, and on the ET/ORB umbilical purge vents.

Orbiter tiles, RCC panels, and SSME's were in nominal configuration. RCS thruster paper covers were intact, though the R1R and R4R covers were discolored.

In summary, the drain inspection produced no IPR conditions and concerns with flight hardware. There were no constraints for the next cryoload.

3.5 FINAL INSPECTION – WEATHER SCRUB 3

A Final Inspection of the cryoloaded vehicle was performed on 26 April 2000 from 1015 to 1110 hours during the two-hour built-in-hold at T-3 hours in the countdown. There were no Launch Commit Criteria (LCC), OMRS, or NSTS-08303 criteria violations relating to the flight hardware. IPR 101V-0310 was taken for two cracks in the +Y longeron.

Due to the time of year, there were no acreage or protuberance icing concerns. The ET LO2 tank acreage temperatures averaged 54 degrees F at the time of the inspection. The surface temperatures on the LH2 tank averaged 56 degrees F. There was no protuberance icing outside of the established database.

Generally, the ET was in excellent condition for a third cryogenic loading. As expected, there were a greater number of small thermal shorts, made visible by frost accumulations, in various places.

The number of cracks detected in ET intertank valley TPS increased from 12 to 14. There were cracks in all four quadrants. The cracks ranged in length from 2 to 18 inches, were less than 3/16-inch wide, had no offset, and exhibited no ice or frost. Therefore, all were acceptable for flight per NSTS-08303

The 5-inch dogleg stress relief crack in the –Y vertical strut TPS was joined by a separate 3-inch long crack. This condition has been accepted for flight on previous vehicles.

IPR 101V-0310 was taken for two cracks in the +Y longeron closeout TPS since this condition was outside the NSTS-08303 guidelines. One crack was 4 inches in length by 3 inches wide by 1/8-inch wide in an inverted horseshoe shape. The second crack was horizontal, 2-inches long, and hairline in width. Although some frost was present, neither exhibited any offset nor unusual temperature gradients as imaged by the infrared radiometer. The two cracks were caused by thermal/mechanical induced stresses and localized defects in the thick BX-250 TPS closeout. In the case of the larger crack, a more severe condition occurred during the second cryoload of STS-99 (reference IPR 099V-0193). That condition was approved for flight via MRB on PR ET-92-TS-0010 and the same rationale, essentially, was used for the condition on this vehicle.

There were no tile or RCC panel anomalies on the Orbiter. All RCS thrust paper covers were intact though the F1D, F2U, F3U, F3L, R1R, and R4R were discolored and wet. Typical amounts of ice and frost had formed on the SSME nozzle to heat shield interfaces.

Launch was scrubbed at the end of the window due to weather violations (high winds).

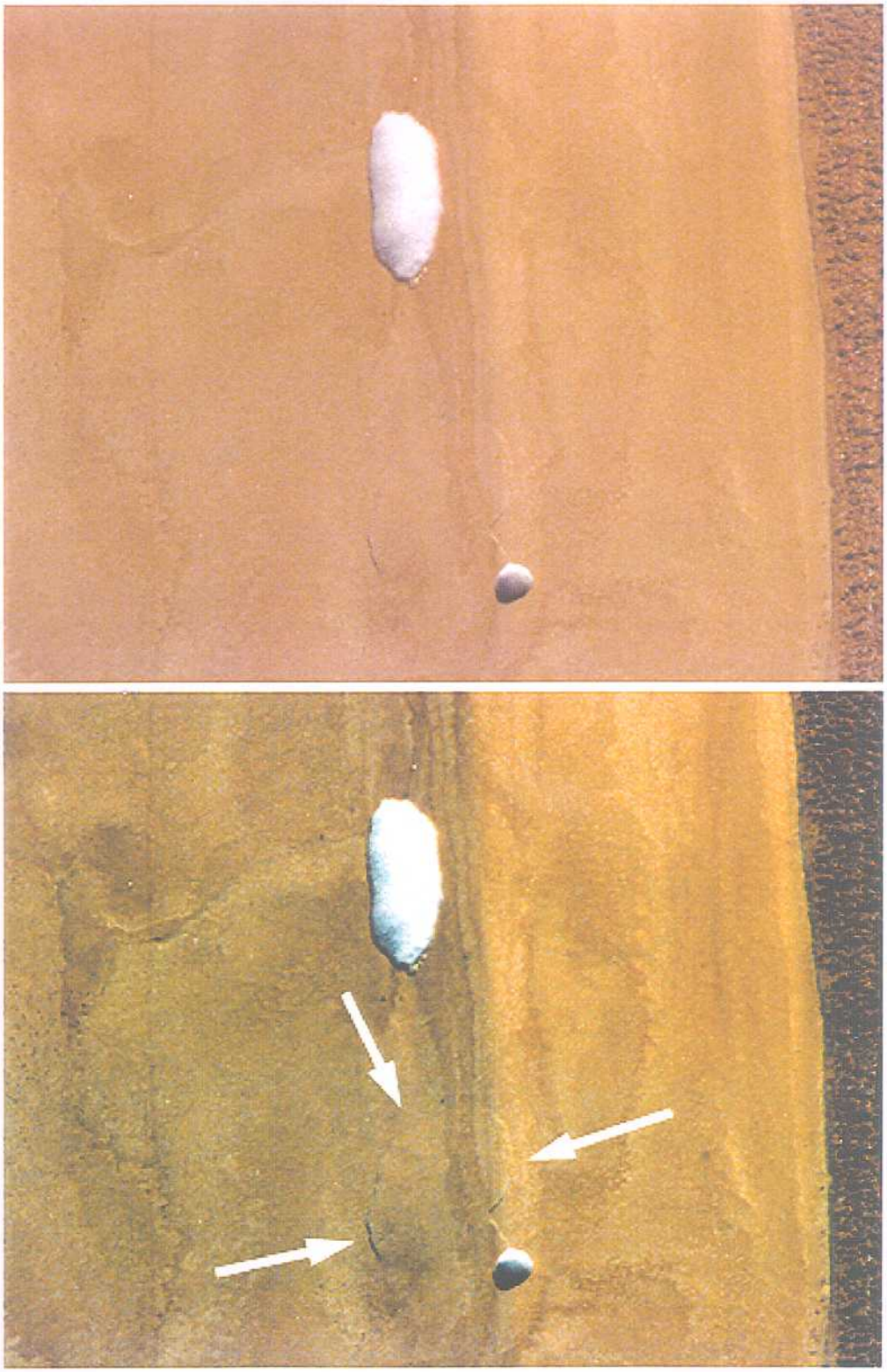

Photo 4: Crack in +Y Longeron TPS

Normal and enhanced views of inverted horseshoe-shaped crack in the +Y longeron TPS

3.6 POST DRAIN INSPECTION

The post drain inspection was conducted on 26 April 2000 from 2010 to 2130 hours under sunset conditions. Prior to leaving LCC Firing room 2, a request was made to have the xenon lights turned on, this request was not fulfilled as the xenon light generators needed refueling. The inspection was performed with adequate available lighting.

The External Tank was in excellent condition. The fourteen cracks in the intertank stringer valleys were no longer visible. Bipod jack pad standoff closeouts were nominal. All PDL repairs were intact with none protruding. No crushed foam or debris was detected in the LO2 feedline support brackets. The two small stress relief cracks in the –Y vertical strut forward surface TPS were not visible.

The crescent shaped crack at station XT-1960 previously documented on IPR 101V-0310 and MRB PR-ET-102-TS-0012 was carefully inspected. The crack was approximately 3-inches by 4-inches horseshoe shaped with an apparent 1/8-inch offset based on shadows cast on the adjacent foam. The ends of the crack were separated by approximately 4 inches of undamaged foam.

A second hairline crack on the +Y longeron closeout foam previously documented during the Final Inspection increased from 2 to 4 inches in length without offset. It remained a singular crack with no evidence of branching.

The –Y GOX vent footprint area had not changed since last inspection. The four areas of missing topcoat had not increased in size and no damage was noted. An inspection of the GOX vent seals revealed no indications of ET topcoat adhesion.

Small amounts of ice/frost accumulations were present at the ET/ORB LO2 and LH2 umbilicals and in the LO2/LH2 feedline bellows.

A small amount of froth and condensate was noted on the aft dome apex along with a small area of frost on the siphon access closeout at the +Y side. No TPS cracks were visible on the LH2 aft dome.

Orbiter tiles, RCC panels, and SSME's were in nominal configuration. RCS thruster paper covers were intact, though the R1R and R4R covers were discolored.

In summary, no new flight hardware concerns were detected during the post drain inspection that presented a constraint for the next launch attempt.